EPITA / InfoS1 January 2016

Name: ..... First name: ..... Group: .....

Midterm exam of Electronics

Calculators and documents are not allowed. The number of points per question is indicative. Answers to be written on this document only. If you need more space, you can use the back of the sheets.

Exercise 1. Course questions: MCQ (6,5 points – without negative points)

Choose the correct answers.

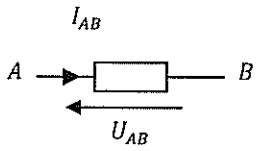
1. A random displacement of electric charges represents :

   a- A resistor
   b- A voltage
   c- A current
   d- None of this

2. Depending on the dipole, the entering current to this dipole may be higher or lower than the going out current.

   a- Right
   b- False

3. We consider the following diagram:



We measure the current and the voltage, we get $I_{AB} < 0$ and $U_{AB} > 0$. The two-terminals is:

   a- A load
   b- A source

4. The Volts per Amperes represent:

   a- Ohms
   b- Siemens
   c- Joules
   d- None of this

5. A branch in an electric circuit is :

   a- A portion of the circuit between two consecutive nodes.
   b- A wire connecting two dipoles.
   c- A portion of circuit containing a source.
   d- A portion of circuit containing a resistor.

6. When we associate together two resistors R_1 and R_2 in parallel, we conserve:

   a- The voltage across R_1
   b- The current flowing through R_1

c- None of this

7. A short-circuited resistor has:

a- An infinite current flowing through it
b- An infinite voltage across its terminals
c- The voltage across its terminals is zero
d- None of this

8. If we apply the Ohm's law using R in $k\Omega$ and I in mA, we obtain U in :

a. kV b. V c. mV d. MV

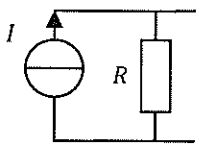
9. To turn-off a current source we replace it by:

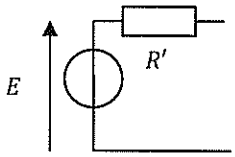
a- A wire
b- An open switch
c- A resistor
d- A voltage source

10. To turn-off a volatge source, we replace it by :

a- A wire
b- A resistor
c- An open switch
d- A current source

We consider the two following circuits:





These two circuits are equivalent if and only if:

11. $E =$

a- I
b- $R.I$
c- $\frac{R'.R}{R+R'}.I$
d- None of this

12. $R' =$

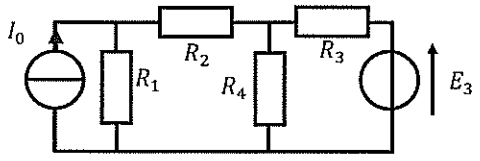
a- R
b- $\frac{R.R'}{R+R'}$
c- $\frac{R}{R+R'}$
d- None of this

13. The Millman's theorem is based on:

a- The Thevenin's theorem
b- The loop's law (KVL)
c- The node's law (KCL)
d- The superposition's theorem

Exercise 2. The Norton's theorem (6 points)

We consider the following circuit, where $R_1 = R_2 = R_3 = R_4 = R$.

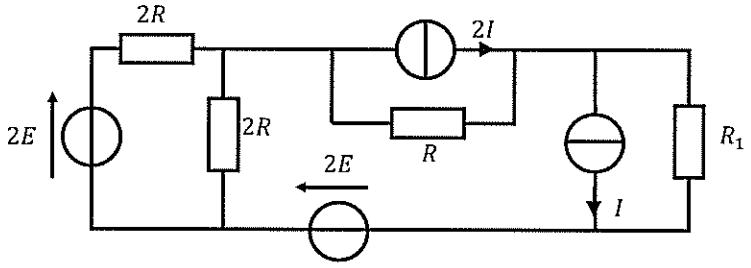


1. Determine the current Norton source seen by R_4. You can choose the method that you want (The Thevenin-Northon equivalence or the Northon's theorem), and you express the result function of I_0, E_3 and R.

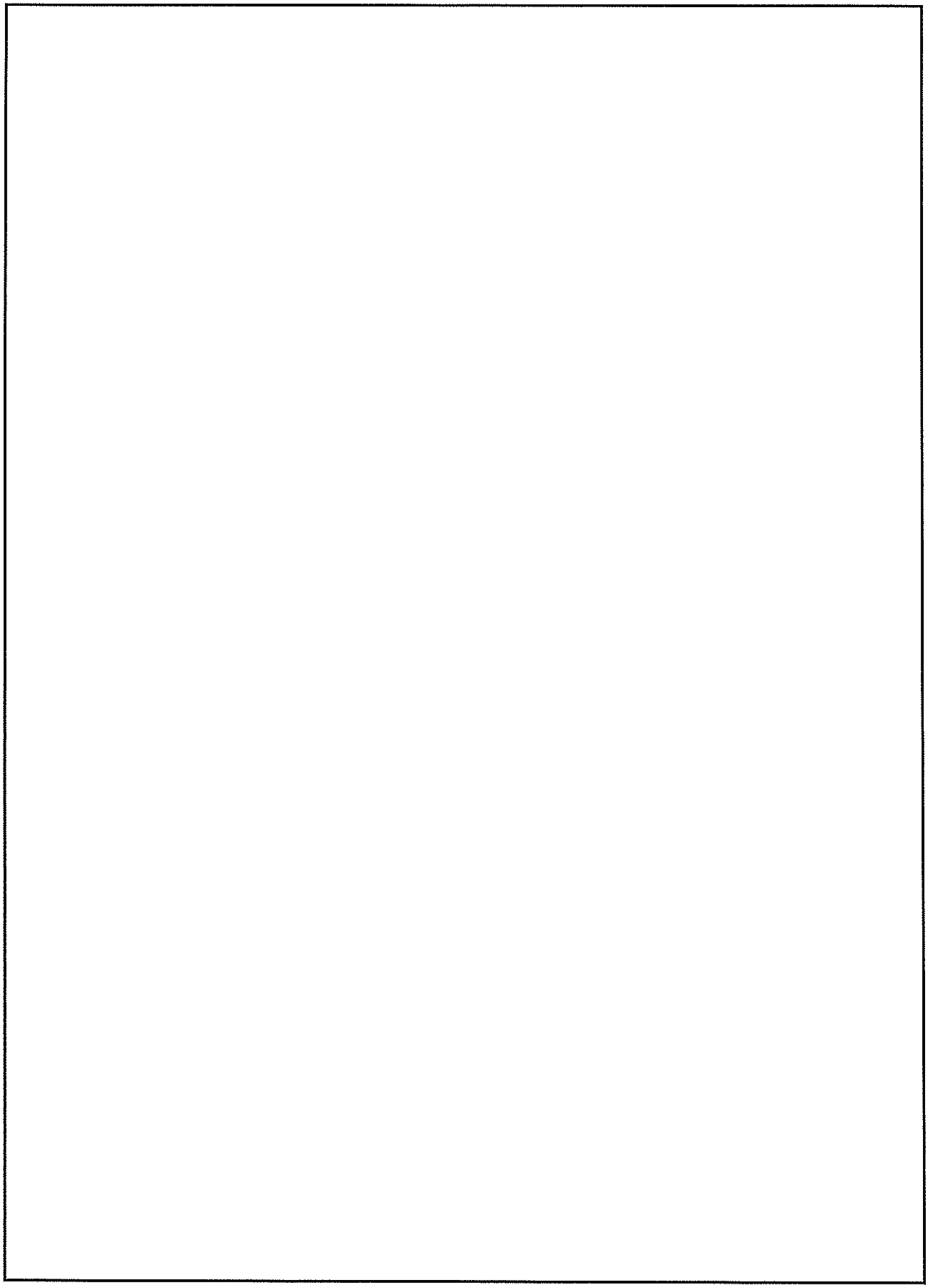
2. Deduce the current flowing through R_4.

Exercise 3. Theorems (7,5 points)

We consider the following circuit:



Express the voltage across the resistor R_1 function of E, I, R and R_1, using the method that you want.



BONUS

We consider the following circuit. Determine the voltage U using the Millman's theorem.